

Online Examinations (Even Sem/Part-I/Part-II Examinations 2020 - 2021)

Course Name - – Linear Algebra and Differential Equations

Course Code - BSC(CSE)201_BSC(ECE)201

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Answer all the questions. Each question carry one mark.

9. 1.

The value of $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega^2 & 1 & \omega \\ \omega^2 & \omega & 1 \end{vmatrix}$ is .

Mark only one oval.

3

2

1

0

10. 2.

If the matrix $\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & \lambda \end{pmatrix}$ is singular then the value of λ is

Mark only one oval.

3

5

2

4

11. 3.

The co-factor of x in the determinant $\begin{vmatrix} x & 1 & 1 \\ 2 & -1 & 0 \\ 1 & 3 & 2 \end{vmatrix}$ is

Mark only one oval.

2

-2

4

-4

12. 4.

The adjoint of the determinant $\begin{vmatrix} 2 & 1 \\ 3 & 6 \end{vmatrix}$ is

Mark only one oval.

$$\begin{vmatrix} 1 & 2 \\ 6 & 3 \end{vmatrix}$$

Option 1

$$\begin{vmatrix} 6 & 3 \\ 1 & 2 \end{vmatrix}$$

Option 2

$$\begin{vmatrix} -6 & 3 \\ 1 & -2 \end{vmatrix}$$

Option 3

$$\begin{vmatrix} 6 & -3 \\ -1 & 2 \end{vmatrix}$$

Option 4

13. 5.

The value of the determinant $\begin{vmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{vmatrix}$ is

Mark only one oval.

1

-1

0

2

14. 6.

If $A = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ then $A.A^T =$

Mark only one oval.

I₂

A

2A

None of these

15. 7.

The rank of the matrix $A = \begin{pmatrix} 2 & 1 \\ 3 & 4 \end{pmatrix}$ is

Mark only one oval.

2

3

4

None of these

16. 8. For what value of μ does the system of equations $x+y+z=1$; $x+2y-z=2$; $5x+7y+\mu z=4$ have a unique solution?

Mark only one oval.

- $\mu \neq 2$
- $\mu \neq 1$
- $\mu \neq 3$
- $\mu \neq 4$

17. 9.

The value of 'a' for which rank of the matrix $\begin{pmatrix} 2 & 0 & 1 \\ 5 & a & 3 \\ 0 & 3 & 1 \end{pmatrix}$ is less than 3?

Mark only one oval.

- $3/4$
- $3/5$
- $3/2$
- 1

18. 10.

The rank of the matrix $\begin{pmatrix} 2 & 2 & 1 \\ 6 & 6 & 3 \end{pmatrix}$ is

Mark only one oval.

- 2
- 3
- 1
- 4

19. 11.

The value of 'k' for which rank of the matrix $\begin{pmatrix} 1 & 1 & 1 \\ 1 & k & 1 \\ 10 & 1 & 0 \end{pmatrix}$ is 2 is

Mark only one oval.

1

0

-1

2

20. 12.

In $\begin{vmatrix} 3 & -2 & 5 \\ -1 & 2 & -3 \\ -5 & 6 & 9 \end{vmatrix}$, the minor and co-factor of -2 are respectively

Mark only one oval.

24,-24

24,24

-24,24

-24,-24

21. 13.

$S = \{(x, y, 0) \mid x, y \in \mathbb{R}\}$ is a subspace of \mathbb{R}^3 , then $\dim(S)$ is

Mark only one oval.

2

3

4

5

22. 14. The expression of the vector $(7,11)$ as a linear combination of the vectors $(2,3)$ and $(3,5)$ is

Mark only one oval.

$1(2,3)+2(3,5)$

$2(2,3)+1(3,5)$

cannot be expressed

None of these

23. 15.

If $\{\alpha, \beta, \gamma\}$ is a basis of a vector space V , then $\{\alpha, \beta + \gamma, \gamma\}$

Mark only one oval.

is a basis of V

linearly dependent

linearly independent but not a basis

None of these

24. 16.

The vectors $(2,1,0), (1,1,0), (4,2,0)$ of R^3 are

Mark only one oval.

- linearly independent but not a basis
- linearly dependent
- basis
- None of these

25. 17.

Let $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$ be defined by $T(x_1, x_2, x_3) = (x_1 + 1, x_2 + 1, x_3 + 1), (x_1, x_2, x_3) \in \mathbb{R}^3$,
then T is a

Mark only one oval.

$$T(\alpha + \beta) = T(\alpha) + T(\beta)$$

Option

linear mapping

is not a linear mapping

None of these

26. 18.

Let V and W be two vector spaces and $T : V \rightarrow W$ is a linear mapping, then T is injective if and only if

Mark only one oval.

$\text{Ker}\{T\}=\{\theta\}$

$\text{Ker}\{T\}=\{0\}$

$\text{Ker } T=V$

none

27. 19.

Let V and W be two vector spaces and $T : V \rightarrow W$ is a linear mapping and θ, θ^1 be the null vectors of V and W respectively, then

Mark only one oval.

$$\text{Ker } T = \{ \alpha \in V \mid T(\alpha) = \theta \}$$

Option 1

$$\text{Ker } T = \{ \alpha \in V \mid T(\alpha) = \theta^1 \}$$

Option 2

$$\text{Ker } T = \{ \alpha \in V \mid T(\alpha) = \alpha \}$$

Option 3

All of these

28. 20. If $T : V \rightarrow W$ be a linear mapping, then

Mark only one oval.

$\dim(\text{Ker } T) + \dim(\text{Im } T) = \dim(V)$

$\dim(\text{Ker } T) + \dim(\text{Im } T) = \dim(W)$

$\dim(\text{Ker } T) + \dim(\text{Im } T) = 3$

None of these

29. 21.

Let $T : \mathbb{R}^3 \rightarrow \mathbb{R}^2$ be a linear transformation defined by $T(x, y, z) = (x - y, x - z)$, then the dimension of the nullspace of T is

Mark only one oval.

 0 1 2 3

30. 22.

Let V be a vector space over the set of all real numbers R. Let θ be the zero vector of V. Then $2\theta = ?$

Mark only one oval.

 0 1 2 3

31. 23. A vector space V is finite dimensional if it has

Mark only one oval.

 finite basis finite elements no basis None of these

32. 24.

Which of the following set span the vector space $\left\{ \begin{bmatrix} x & 0 \\ 0 & y \end{bmatrix} : x, y \in \mathbb{R} \right\}$?

Mark only one oval.

$$\left\{ \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \right\}$$

Option 1

$$\left\{ \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix} \right\}$$

Option 2

$$\left\{ \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 0 \\ 0 & -1 \end{bmatrix} \right\}$$

Option 3

$$\left\{ \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \right\}$$

Option 4

33. 25. Which of the following is not linear transformation?

Mark only one oval.

$$T: \mathbb{R}^2 \rightarrow \mathbb{R}^2 : T(x, y) = (3x - y, 2x)$$

Option 1

$$T: \mathbb{R}^3 \rightarrow \mathbb{R}^2 : T(x, y, z) = (3x + 1, y - z)$$

Option 2

$$T: \mathbb{R} \rightarrow \mathbb{R}^2 : T(x) = (5x, 2x)$$

Option 3

$$T: \mathbb{R}^3 \rightarrow \mathbb{R}^2 : T(x, y, z) = (x, 0, z)$$

Option 4

34. 26.

Let $T: \mathbb{R}^2 \rightarrow \mathbb{R}^3$ be a linear transformation given by $T(x, y) = (x + y, x - y, y)$, then rank of T is

Mark only one oval.

0

1

2

3

35. 27.

Let $T : V \rightarrow W$ be a linear transformation and $\text{rank}(T)=m$, then

Mark only one oval.

- $\dim(V) = m$
- $\dim(\text{Ker } T) = m$
- $\dim(\text{Im } T) = m$
- $\dim(W) = m$

36. 28.

Let $T : R^n \rightarrow R^n$ be a linear transformation. Which one of the following statement implies that T is bijective?

Mark only one oval.

- $\text{nullity}(T) = n$
- $\text{rank}(T) = \text{nullity}(T) = n$
- $\text{rank}(T) + \text{nullity}(T) = n$
- $\text{rank}(T) - \text{nullity}(T) = n$

37. 29.

If $A^2=A$, then its Eigen values are either

Mark only one oval.

- 0 or 2
- 1 or 2
- 0 or 1
- Only 0

38. 30.

If $\lambda \neq 0$ is an Eigen value of a matrix A then $\det(A - \lambda I) =$

Mark only one oval.

λ

$-\lambda$

2λ

0

39. 31.

If $\lambda \neq 0$ is an Eigen value of a matrix A then the matrix A^{-1} has an Eigen value

Mark only one oval.

λ

$-\lambda$

$1/\lambda$

None of the options

40. 32.

The sum of the Eigen values of the matrix $A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$ is

Mark only one oval.

5

-5

7

-7

41. 33.

If A is a non-null square matrix then $A+A^T$ is a

Mark only one oval.

- symmetric matrix
- skew-symmetric matrix
- null matrix
- Identity Matrix

42. 34.

If A is a non-null square matrix then $A-A^T$ is a

Mark only one oval.

- symmetric matrix
- skew-symmetric matrix
- Identity Matrix
- Orthogonal matrix

43. 35.

If A is an orthogonal Matrix then what can we say about the matrix A

Mark only one oval.

- Singular Matrix
- Non-Singular Matrix
- Symmetric Matrix
- Skew-Symmetric matrix

44. 36.

If $\det(A) \neq 0$ then what can we say about the matrix A

Mark only one oval.

0 is an eigen value of A^{-1}

Option 1

$\text{tr}(A) \neq 0$

Option 2

0 cannot be eigen value of A^{-1}

Option 3

A is a skew symmetric matrix

45. 37.

If A is similar to the matrix B then A^{-1} is similar to the matrix

Mark only one oval.

A

B

$\text{Inv}(B)$

$\text{tr}(A)$

46. 38.

If A has an Eigen vector v and $A = P^{-1}BP$ then B has an Eigen vector
Mark only one oval.

 Pv Option 1
 $P^{-1}v$ Option 2
 v Option 3
 v^{-1} Option 4

47. 39.

If $V = R^3$ be equipped with inner product $(x, y) = x_1y_1 + 2x_2y_2 + 3x_3y_3$, In this inner product space $(V, (\cdot, \cdot))$ which of the following pairs of vectors is orthonormal?

Mark only one oval.

$$u = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, v = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

Option 1

$$u = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, v = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

Option 2

$$u = \begin{bmatrix} \frac{1}{\sqrt{3}} \\ 0 \\ 0 \end{bmatrix}, v = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

Option 3

$$u = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}, v = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$$

Option 4

48. 40.

If $V = \mathbb{R}^3$ be equipped with inner product $(x, y) = x_1y_1 + 2x_2y_2 + 3x_3y_3$, In this inner

product space $(V, (\cdot, \cdot))$ then the value of the inner product of $u = \begin{bmatrix} 1 \\ 1 \\ \frac{1}{\sqrt{3}} \end{bmatrix}, v = \begin{bmatrix} 0 \\ \frac{1}{2} \\ \frac{1}{\sqrt{3}} \end{bmatrix}$

Mark only one oval.

$$\frac{2}{\sqrt{2}}$$

Option 1

$$2\sqrt{2}$$

Option 2

$$\frac{\sqrt{3}}{2}$$

2

Option 4

49. 41.

If $V = \mathbb{R}^3$ be equipped with inner product $(x, y) = x_1y_1 + x_2y_2 + x_3y_3$. In this inner product space $(V, (\cdot, \cdot))$ which of the following pairs of vectors is orthonormal?

Mark only one oval.

$$u = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, v = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

Option 1

$$u = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, v = \begin{bmatrix} 0 \\ 1 \\ 2 \\ 0 \end{bmatrix}$$

Option 2

$$u = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, v = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$$

Option 3

$$u = \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}, v = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$$

Option 4

50. 42. The diagonalizing matrix is also known as

Mark only one oval.

- Eigen Matrix
- Constant Matrix
- Modal Matrix
- State Matrix

51. 43.

If $\lambda = 1$ is an Eigen value of the matrix $\begin{bmatrix} 3 & 1 \\ 2 & 2 \end{bmatrix}$ then the corresponding Eigen vector

is

Mark only one oval.

$$\begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

Option 1

$$\begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

Option 2

$$\begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

Option 3

$$\begin{bmatrix} -1 \\ -1 \end{bmatrix}$$

Option 4

52. 44.

If $V = R^3$ be equipped with inner product $(x, y) = x_1y_1 + x_2y_2 + x_3y_3$. Then which of the following set of vectors are linearly independent.

Mark only one oval.

$\{(0, 1, 0), (0, 0, 1), (-1, 0, 1)\}$

Option 1

$\{(0, 1, 0), (0, -1, 0), (0, 0, 1)\}$

Option 2

$\{(0, 1, 0), (0, 0, 1), (-1, 0, 1)\}$

Option 3

$\{(1, 0, 1), (0, 1, 0), (-1, 0, 1)\}$

Option 4

53. 45.

What is the value of k so that the vectors $(1, -2, -3)$ and $(2, k, 4)$ are orthogonal

Mark only one oval.

-5

5

-10

10

54. 46. Which of the following matrix is orthogonally diagonalizable

Mark only one oval.

$$\begin{bmatrix} 0 & 2 & 3 \\ 2 & 0 & 4 \\ -3 & 4 & 0 \end{bmatrix}$$

Option 1

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 4 \\ 3 & 4 & 3 \end{bmatrix}$$

Option 2

$$\begin{bmatrix} 1 & 2 & 3 \\ -2 & 4 & 4 \\ -3 & -4 & 3 \end{bmatrix}$$

Option 3

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 4 \\ 0 & 0 & 3 \end{bmatrix}$$

Option 4

55. 47.

If λ is an Eigen value of an orthogonal matrix A the which of the following statement is false

Mark only one oval.

$$\det(A - \lambda I) = 0$$

Option 1

$$\det\left(A - \frac{1}{\lambda} I\right) = 0$$

Option 2

$$\det(A^{-1} - \lambda I) = 0$$

Option 3

One of a, b and c is false

56. 48.

The differential equation $(a_1x - b_1y)dx + (a_2x - b_2y)dy = 0$ is exact if

Mark only one oval.

$$a_1 = b_2$$

Option 1

$$b_1 = b_2$$

Option 2

$$a_1 = -b_2$$

Option 3

$$a_2 = -b_1$$

Option 4

57. 49.

If $x^m y^n$ be the IF of the equation $(2y dx + 3x dy) + 2xy(3y dx + 4x dy) = 0$ then the value of m and n are respectively

Mark only one oval.

- 1,3
- 2,1
- 1,2
- 2,2

58. 50.

The general form of a first order linear equation in x is $\frac{dy}{dx} + Px = Q$ where

Mark only one oval.

- P and Q are both functions of x
- P and Q are both functions of y
- P and Q are the functions of x and y , respectively
- P and Q are the functions of y and x , respectively

59. 51.

The general solution of $\left(\frac{dy}{dx}\right)^2 + \frac{dy}{dx} - 6 = 0$ is

Mark only one oval.

- $(y+3x-c)(y-2x-c)=0$
- $(y+3x-c1)(y-2x-c2)=0$
- $(y+3x)(y-2x-c)=0$
- None of these

60. 52.

$$a_2 = -b_1$$

Mark only one oval.

$$c_1x + c_2e^{3x}$$

Option 1

$$c_1e^x + c_2e^{3x}$$

Option 2

$$c_1 + c_2e^{3x}$$

Option 3

None of these

61. 53.

The integrating factor of $\cos x \frac{dy}{dx} + y \sin x = 1$ is

Mark only one oval.

tan x

cos x

sec x

sin x

62. 54.

$$\frac{1}{D^2 + 4} \sin 2x =$$

Mark only one oval.

$$\frac{1}{4} x \cos 2x$$

 Option 1

$$\frac{\cos 2x}{2}$$

 Option 2

$$-\frac{1}{4} x \cos 2x$$

 Option 3 None of these

63. 55.

$$\frac{1}{(D-2)(D-3)}e^{2x} =$$

Mark only one oval.

$$-e^{2x}$$

Option 1

$$xe^{2x}$$

Option 2

$$-xe^{3x}$$

Option 3

$$-xe^{2x}$$

Option 4

64. 56.

The Wronskian for the differential equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 9e^x$ is

Mark only one oval.

 e^{2x}

Option 1

 e^x

Option 2

 e^{3x}

Option 3

None of these

65. 57.

The P.I. of the equation $2x \frac{d^2y}{dx^2} + 2 \frac{dy}{dx} = \frac{1}{x}$ is

Mark only one oval.

$$\frac{1}{4}x^2$$

Option 1

$$\frac{1}{2}x^2$$

Option 2

$$\frac{1}{4}(\log x)^2$$

Option 3

$$\frac{1}{2}(\log x)^2$$

Option 4

66. 58.

For the simultaneous equation $\frac{dx}{dt} + y = \sin t$, $\frac{dy}{dt} + x = \cos t$, which of the following is true?

Mark only one oval.

$$x = c_1 \cos t + c_2 \sin t$$

Option 1

$$x = c_1 e^t + c_2 e^{-t}$$

Option 2

$$x = (c_1 + c_2 t) e^t$$

Option 3

None of these

67. 59.

For $a, b, c \in \mathbb{R}$, if the differential equation

$$(ax^2 + bxy + y^2)dx + (2x^2 + cxy + y^2)dy = 0$$
 is exact, then

Mark only one oval.

a=2, c=2a

b=4, c=2

b=2, c=4

b=2, a=2c

68. 60.

The PDE $r^2 + 2s - t^2 = 0$ is of order

Mark only one oval.

1

2

3

4

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